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SCHWEGMAN, LUNDBERG, WOESSNER & KLUTH, P.A.
P.O. BOX 2938
MINNEAPOLIS, MN 55402

EXAMINER	
PERT, EVAN T	

ART UNIT	PAPER NUMBER
2829	

DATE MAILED: 05/07/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 09/945,555	Applicant(s) GILGEN ET AL.	
	Examiner Evan T. Pert	Art Unit 2829	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *19 February 2003* .

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-50* is/are pending in the application.

4a) Of the above claim(s) *10,13,24,29-32,38 and 44* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9,11,12,14-23,25-28,33-37,39-43 and 45-50* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *30 August 2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11)☐ The proposed drawing correction filed on _____ is: a)☐ approved b)☐ disapproved by the Examiner.

If approved, corrected drawings are required in reply to this Office action.

12)☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____ .

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).

a) ☐ The translation of the foreign language provisional application has been received.

15)☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____ .
4) ☐ Interview Summary (PTO-413) Paper No(s). _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other:

DETAILED ACTION

Election/Restrictions

1. Claims 10, 13, 24, 29-32, 38 and 44 are withdrawn from further consideration pursuant to 37 CFR 1.142(b), as being drawn to nonelected species, there being no allowable generic or linking claim. Applicant timely traversed the restriction requirement in Paper No. 10.

Applicant's request for reconsideration and withdrawal of the species restriction is acknowledged. Applicant indicates that "the four species identified by the examiner contain highly overlapping groups" [p. 1, paper 10]. This argument is not convincing since many patents have highly overlapping limitations, yet are "patentably distinct." Indeed, while "applicant believes there are no clear species in claims 1-50," applicant was able to identify a group of claims that are clearly "readable on" species I.

Furthermore, applicant failed to admit that any species are obvious variants of any other species or the generic claim, so the examiner understands that applicant believes the four species identified by the examiner are indeed "patentably distinct" [which is *quite* different than "patentable"].

2. While applicant's request to withdraw the species requirement has not been granted, the examiner does withdraw the restriction requirement between method and device claims set forth in paper no. 7 [allowing double-patenting rejections as well as rejoinder of cancelled claims].

The originally restricted method-device sets of claims [paper no. 7] are more highly related than the four generalized species identified by the examiner in paper no. 9, with the choice of "predetermined shape" being the only patentability distinction between method and device.

Oath/Declaration

3. Applicant is reminded that the Declaration is a serious matter. The Declaration states that both inventors have read and understand the specification, including the claims, and believe they are the first inventors.

Yet, claim 1, as an example, is so notoriously well known that it actually sets forth *the definition* of a stacked capacitor known to anyone of the most rudimentary skill in the art for decades, and is anticipated by thousands of patents, articles, textbooks, and other references, even including the patent office's Manual of Classification, such as for Class 438, Subclass 396, among others. As a trained electrical engineer and educator, the examiner simply cannot reasonably understand how the inventors could have actually *read and understood the claims* prepared by the attorney in this case, as they signed their names to it on the Declaration.

Presenting claims to prior art *knowingly* would be "punishable," yet the examiner is not in a position to prove that someone is saying something like "I invented the wheel" without believing it. Therefore, these examiner's comments on the Declaration are merely set forth as a reminder to applicant of the importance of the Declaration and the inventors' involvement with reading and understanding what the attorney wrote.

The Declaration is accepted merely on its face with the examiner's expert personal beliefs and intuition set aside.

Claim Objections

4. Claims 2 and 3 are objected to under 37 CFR 1.75(c), as being of improper dependent form for failing to further limit the subject matter of a previous claim.

Claim 2 is not further limiting because all known electrically "conductive material" includes "metal or semiconductor", somewhere in the material. Otherwise, the material is known as "insulator" and cannot conduct (i.e. not conductive).

Claim 3 is not further limiting because "any dielectric" is broader than "a dielectric."

Applicant is required to cancel claims 2 and 3, or amend these claims to place them in proper dependent form, or rewrite them in independent form.

Claim Rejections - 35 USC § 112

5. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which applicant regards as the invention.

Claims 1-9, 11-12, 14-23, 25-28, 33-37, 39-43 and 45-50 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claims 4-6

Regarding claim 4, there is a lack of antecedent basis for "the first conductive layer." For purposes of examination, "the first conductive layer" in claim 4 is viewed as being "the first plate of conductive material" in claim 1.

Regarding claims 5 and 6, there is a lack of antecedent basis for "the open interior portion." For examination purposes, "the open interior portion" in claims 5 and 6 is interpreted as being "an open interior portion."

Predetermined Shape [Claims 1-9]

The term "predetermined" in claims 1-9 is a relative term, which renders the claims indefinite. The term "predetermined" is not defined by the claims, the specification does not provide a standard for ascertaining the requisite degree, and one of ordinary skill in the art would not be reasonably appraised of the scope of the invention. Applicant's use of "predetermined" reads on a nebulous mental step conducted prior to manipulative steps making the device, rendering claim scope unclear. If applicant wishes to patent detail controls over the recited product-by-process, then the product-by-process steps must be positively recited. See Seagram & Sons Inc. vs. Marshall, 84 USPQ 180. (Removal of the world "predetermined" would overcome this rejection.)

Substantially Cone-Shaped [Claims 11-12, 14-23, 25-28, 33-37, 39-43 & 45-50]

The scope and meaning of "substantially cone-shaped" is confusing and ill defined. The dictionary defines a "cone shape" as a shape generated by rotating a right triangle around its base. Yet, applicant refers to non-conical tapered via openings as being "substantially cone-shaped" [Fig. 2 per p. 8, lines 12-14].

For purposes of examination, the examiner considers "substantially cone-shaped" as being specifically "*cone*-shaped" as is seen, for example in Prior Art Fig. 25 of U.S. Patent 6,215,187 B1. The record requires clarification as to what falls within the scope of "substantially cone-shaped," as used by applicant. For example, is a "frusto-conical" shape visible on the cover of U.S. 6,215,187 actually "substantially cone-shaped"?

Layer of "forming material" [Claims 14, 17, 18, 21-23, 26-28, 35-37, 40-43, 47-50]

The scope of meaning of "layer of forming material" is unclear. The examiner understands that the layer of forming material helps form and "can support" the capacitor plates. Yet, the specification fails to define or clarify the scope of a "layer of *forming* material." For purposes of examination, the layer of "forming material" is viewed as any layer of material that is part of forming the device, which is any layer in a semiconductor device because all layers in a device are part of "forming" the device.

A "nucleation layer" [Claims 18, 21-23, 28, 36, 37, 42, 48 and 49]

The scope of meaning of *applicant's* "nucleation layer" is unclear. The specification states that this layer is optional, can act as "an etch stop," and facilitates the deposition of a dielectric layer above it. For purposes of examination, the claimed "nucleation layer" is any layer that has a thin overlying dielectric layer deposited on it.

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in a patent granted on an application for patent by another filed in the United States before the invention thereof by the applicant for patent, or on an international application by another who has fulfilled the requirements of paragraphs (1), (2), and (4) of section 371(c) of this title before the invention thereof by the applicant for patent.

7. Claims 1, 2, 3, 7 and 9 are rejected under 35 U.S.C. 102(b) as being clearly anticipated by Gray and Meyer (Undergraduate Textbook), as one example of thousands.

Regarding claims 1, 2, 3 and 9, Fig. 2.64b of Gray & Meyer clearly depicts a notoriously well-known stacked capacitor with metallic-behaving polysilicon (semiconductor material) plates and SiO_2 (dielectric) inherently conforming to the first (bottom) plate.

Regarding claim 7, the plates are inherently thicker than the dielectric because the dielectric has a thickness comparable to a gate oxide [p. 169], which is too thin for a polysilicon conductive plate to remain reasonably conductive without introducing unacceptable resistance into the capacitor.

8. Claims 1-4, 9, 11, 14-16, 18-20, 22, 26 and 28 are rejected under 35 U.S.C. 102(e) as being anticipated by Ooto et al. (U.S. 6,215,187).

Ooto teaches a "capacitor" comprising a first plate of polysilicon (i.e. semiconductor) conductive material [108b in Fig. 25] formed in the predetermined shape of a cone, with dielectric layer 101 conforming to the shape of the first plate, and a second capacitor plate 109 over the dielectric 101 and first plate 108b. The depth of the first plate is greater than the width (i.e. notoriously well known 3-D structure). There is a layer of oxide dielectric forming material 105c and the vertex of the cone of the first plate extends partially into the forming layer 105c. There is a nucleation layer 105j and the first plate extends completely through it. The forming layer 105c can be doped oxide and the nucleation layer 105j undoped oxide [col. 16, line 60 to col. 17, line 5]. There is an electrode in the forming material layer [e.g. 107 is inherently an "electrode" in the forming layer]. There is also a plurality of plates [i.e. two shown] as seen in Fig. 25.

Claim Rejections - 35 USC § 103

9. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10. Claims 12, 17, 21, 23, 25 and 27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ooto et al. as applied to claims 11, 14, 18 and 22, above, and further in view of Watanabe et al. (1995 IEEE Article).

Ooto et al. are silent about notoriously well-known HSG for increasing capacitance by increasing surface area of the bottom capacitor plate.

Watanabe et al. disclose one particular method of forming HSG wherein the surface area of any structural type of storage electrode can be increased by converting it to HSG [last sentence Section I].

It would have been obvious to one of ordinary skill in the art at the time of the claimed invention to produce a hemispherical-grained (HSG) Si surface on the lower cone-shaped electrode disclosed by Ooto et al. as in Fig. 25.

One of ordinary skill in the art would have been motivated to increase the cone-shaped capacitor's capacitance in Fig. 25 of Ooto et al., without increasing capacitor real estate, by using HSG electrode roughening, as is notoriously well known in the art [see introduction to Watanabe et al.].

11. Claims 5 and 6 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ooto et al. as applied to claim 1 above, and further in view of Yoshida et al. (U.S. 6,166,941).

Ooto et al. are silent about the cross-sectional shape of the stacked capacitors disclosed in their patent.

Yoshida et al. teach that storage nodes for DRAMs are typically "oval" (i.e. elliptical), but also present a patent showing an advantage of circular cross-sections for storage nodes.

It would have been obvious to one of ordinary skill in the art at the time of the claimed invention to have adopted either elliptical or circular cross-sections as taught by Yoshida et al. since elliptical (i.e. oval or oblong) cross-sections avoid causing a short (col. 1, lines 49-51) as in the prior art, and circular cross-sections present an improvement of "relaxed layout" [summary of invention in view of cover figure].

12. Claims 33, 35, 36, 40, 42, 43, 45, 47, 48 and 50 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ooto et al. as applied to claims 12, 14, 18, above, and further in view of Burns and Bond (Undergraduate Textbook).

Ooto et al. are silent about the notoriously well known basics of a DRAM memory with array of memory elements, each memory element with capacitor, the DRAM taking the form of an integrated circuit supported by a substrate, along with a processor connected to the memory I.C.

Burns and Bonds teach undergraduates about the basics of which Oooto et al. are silent [Section 9.5, particularly Fig. 9.17]. It would have been obvious to use the capacitors taught by Ooto et al. in a DRAM device formed as an integrated circuit supported by a substrate with the DRAM connected to a "processor" because a processor clocks and refreshes the capacitors, along with addressing the memory, and I.C. chips (i.e. semiconductor die) are notoriously well known as being the primary advantageous way of mass producing many duplicate semiconductor devices on a single wafer at once, to save time and money.

13. Claims 34, 37, 39, 41, 46 and 49 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ooto et al. in view of Burns and Bond as applied to claims 33, 36, 40, 45 and 48 above, and further in view of Watanabe et al. 1995 IEEE article).

Regarding claims 37 and 49, Burns and Bond teach undergraduates the basics of a DRAM memory including rows and columns, address lines, data lines, each memory element (w/ element known as "cell") having a capacitor and transistor coupled at S/D terminals as claimed [see Fig. 9.17 and associated text].

Neither Ooto et al. or Burns and Bond teach the notoriously well-known use of HSG for increasing surface area to increase capacitance.

It would have been obvious to one of ordinary skill in the art at the time of the claimed invention to have adopted notoriously well known HSG as taught by Watanabe et al., motivated to increase capacitance when adopting the capacitors taught by Ooto et al. in a DRAM memory cell.

One of ordinary skill in the art would have been motivated to use a capacitor array taught by Ooto et al. for a DRAM because the single transistor/single capacitor memory cell design is the "ultimate in compactness" as is taught by Burns and Bond [p. 390].

14. Claim 8 is rejected under 35 U.S.C. 103(a) as being unpatentable over Gray and Meyer as applied to claim 1 above, and further in view of Official Notice.

Gray and Meyer do not disclose that the thickness of a capacitor plate is "300 angstroms." However, the courts have held that, absent unexpected results, changes in size and shape of prior art devices do not constitute patentable features. Arriving at a capacitor plate thickness of 300 angstroms would have been obvious to one of ordinary skill in the art based on notoriously well-known electrical engineering principles taken with routine experimentation. One of ordinary skill would like to make the plate thick enough to have negligible lateral resistance, but as thin as possible to avoid introducing unnecessary internal series resistance to the capacitor which would slow down access to the charge on the capacitor [MPEP 2144].

Conclusion

15. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Evan T. Pert whose telephone number is 703-306-5689. The examiner can normally be reached on M-F (7:00-3:30).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Kamand Cuneo can be reached on 703-308-1233. The fax phone numbers for the organization where this application or proceeding is assigned are 703-308-7722 for regular communications and 703-308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0956.

EVAN PERT

Evan Pert, BSEE, MSEE, P.E.

Electrical Engineer

ETP
May 5, 2003